Question	Scheme	Marks
5(a)	$h = 0.6$	**B1**
	$\text{Area} \approx \frac{0.6}{2}\{1.5 + 2(0.48 + 0.30 + 0.26 + 0.26 + 0.30 + 0.48) + 1.5\}$	**M1**
	$0.3 \times 7.16\left(\frac{0.3 \times 179}{25}\right) = 2.15\left(\text{m}^2\right)$	**A1**
		(3)
(b)	Total side area $= 0.9 \times 1.5 \times 2 + \text{'2.148'} = (4.848..)$	**M1**
	$\text{Volume} \approx 2.5 \times \text{'4.848'}$	**dM1**
	$12.1\left(\text{m}^3\right)$	**A1**
		(3)
(c)	Overestimate with valid reason, e.g. area of trapezia are bigger than cross sectional area.	**B1**
		(1)
		(7 marks)

(a)

B1: Correct value for h stated or used. The mark may be implied by $0.3 \times \{\}$ or $\frac{0.6}{2}\{....\}$

M1: Correct attempt at the trapezium rule with their value for h.

Look for $\frac{h}{2}\{1.5 + 1.5 + 2(0.48 + 0.30 + 0.26 + 0.26 + 0.30 + 0.48)\}$ o.e.

Allow the M1 if one of the middle values is missing or miscopied e.g. 0.84 for 0.48 but the overall shape of the formula must be correct. Condone a missing trailing bracket

If they write $\frac{0.6}{2}(1.5 + 1.5) + 2 \times (0.48 + 0.30 + 0.26 + 0.26 + 0.30 + 0.48)$ it is M0 unless followed by the correct answer.

May see $\frac{\text{"0.6"}}{2}\{3 + 4(0.48 + 0.30 + 0.26)\}$ if they realise the symmetry, or calculations involving individual trapezia.

A1: Correct answer, accept awrt 2.15. Units are not required. You may see $\frac{537}{250}$ which is fine

(b)

M1: Attempts to find the total area of cross section. Look for $0.9\times1.5\times2+\text{'2.148'}=$

Condone attempts where only one end is used. Look for $0.9\times1.5+\text{'2.148'}=$

This may be implied by a correct attempt at a volume calculation. See the dM1

So $\left(0.9\times1.5\times2+\text{'2.148'}\right)\times2.5=\left(2.7+\text{'2.148'}\right)\times2.5=$ which scores M1, dM1,

And $\left(0.9\times1.5+\text{'2.148'}\right)\times2.5=\left(1.35+\text{'2.148'}\right)\times2.5$ which scores M1, dM0

Longer methods exist. E.g. Cross-sectional area = rectangle - empty curved region;

Region above *C* is 4.2×1.5 – '2.148' = 4.152. So Cross-sectional area = $6\times1.5-4.152$

dM1: Correct attempt at a volume of the ramp. It is dependent upon the previous M mark

Look for $\left(0.9\times1.5\times2+\text{'2.148'}\right)\times2.5=\left(2.7+\text{'2.148'}\right)\times2.5=..$

or equivalent such as $0.9\times1.5\times2.5+0.9\times1.5\times2.5+\text{'2.148'}\times2.5=...$

Note that longer methods may be seen

A1: Correct answer, awrt 12.1 (m^3). Ignore any reference to units.

SPECIAL CASE 1, 0, 0: Some candidates mis-interpret the question and believe that the concrete is only used on the curved section

Calculates the concrete for the curved section or the curved section with one 'end'.

So, for M1, dM0, A0 the calculation $\text{'2.148'}\times2.5=$ with no additional work

(c)

B1: States **overestimate** AND gives a valid reason.

The reason, in almost all cases, should explicitly compare the area of the trapezia with the shaded area.

All reasons must make some reference to 'trapezia' or 'area of a trapezium'

The Figure could be used to explain their reasoning so look carefully at what the candidate states

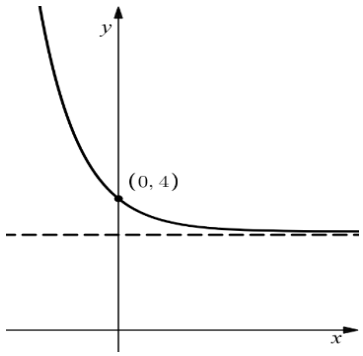
Condone 'the trapezia are bigger than the cross section'

'the top lines of the trapezia are above the curve'

'the curve is **under** the lines of the trapezia'

'part of the trapezium is **above** the ramp'

Do NOT accept any reference to convex or concave without further clarification or trapezium lying outside the curve without a diagram to explain that it creates more area

Question	Scheme		Marks
6(i)(a)		Correct shape or correct y intercept	M1
		Correct shape, position and y intercept	A1
		Correct equation of the asymptote	B1
			(3)
(b)	$\log\frac{1}{5^x} = \log 20 \Rightarrow x = -\frac{\log 20}{\log 5}$ or e.g. $x = \log_{\frac{1}{5}} 20$		M1
	$= -1.86$		A1
			(2)
(ii)	(a) Addition law $\log_4 64x = \log_4 64 + \log_4 x$		M1
	$3 + a$		A1
			(2)
	(b) $\log_4 \frac{2}{x^2} = \log_4 2 - \log_4 x^2$		M1
	$\log_4 \frac{2}{x^2} = \log_4 2 - 2\log_4 x$		dM1
	$\frac{1}{2} - 2a$		A1
			(3)
			(10 marks)

(i)(a)

M1: For **either** of

- an exponential decay type shape, in any position. Be tolerant with "pen flicks" at each end
- the correct y intercept either stated as (0, 4) or labelled on the graph at 4. The graph must cross (not touch) the y - axis at this point. Condone (4, 0) as long as it is in the correct place

A1: Fully correct shape and position. Requires

- curve in quadrants 1 and 2 only
- Allowable gradients. Look at Practice and the Exemplar sheet
- y intercept labelled on graph as 4, (0, 4) or (4, 0) which is condoned

B1: For stating that $y = 3$ is the asymptote to their graph. The curve must be asymptotic at $y = 3$

It must be an equation, not just the line labelled at 3. It must be the only asymptote and the graph must appear to level out below the intercept